Historic American Engineering Record

Barrackville Covered Bridge
Barrackville
Marion Co.
West Virginia

HAER WV-8

REDUCED 8" x 10" DRAWINGS

Barrackville Covered Bridge
Barrackville
Marion County
West Virginia

HAER No. WV-8

PHOTOGRAPHS

WRITTEN DESCRIPTIVE AND HISTORICAL DATA

HISTORIC AMERICAN ENCINEERINC RECORD

BARRACKVILLE COVERED BRIDGE

HAER WV-8

Location:	Barrackville, West Virginia Grant Town Quad 17.571520.4373040
Date of Construction:	1853
Present Owner:	West Virginia Department of Highways
Significance:	Built as part of Virginia's network of turnpikes linking the Tidewater to the Trans-Allegheny regions, this example of the Burr truss demonstrates the high level of craftsmanship and knowledge of contemporary engineering design that went into many covered bridges.
Historian:	Dennis M. Zembala

INTRODUCTION

Part and parcel of the great changes effected by the Industrial Revolution was a series of innovations in transportation modes which greatly increased the speed and manner of moving people and goods. Going backward from the present "Jet Age" preceeding modes have included the airplane, the automobile, the railroad, the canal and the turnpike, with the most recent generally acknowledged as having had the most revolutionary social and economic effects. Turnpikes, on the other end of the list, are usually considered as the least noteworthy in this respect. In fact, the teamster with his wagon or stagecoach is generally looked on as part of a pre-industrial era and the contribution of early turnpikes to the quickening of industrial activity both here and abroad is frequently overlooked. It is easy to see the inaccuracy of this assumption if we consider for a moment the state of transportation prior to the construction of turnpikes and roads. The majority of transportation arteries were narrow paths and trails. People traveled on foot or on horseback and goods traveled on pack horses or, in more developed areas, in two-wheeled oxcarts. During inclement weather, such routes were often impassable even to these primitive conveyances. During the eighteenth century, the appearance of relatively good, hard-surfaced roads and turnpikes increased the speed of passenger travel and the ease of bulk transport of goods. It was in this last area that the impact of turnpikes was especially important to the growth of commerce and industry. Four-wheeled freight wagons made more efficient use of dray animals, thereby lowering the cost of transport, and widening the potential markets of individual companies. It was during the turnpike era, then, that constant improvements in transportation technology became firmly established as one of the distinguishing aspects of industrial societies. No one would hesitate

The Turnpikes

After the Revolutionary War, the major coastal cities from Boston to Charleston competed for control of the trade and wealth of the interior. Before the War, the fortunes of these centers had been determined to a large extent in the compromise atmosphere of Parliament and court where relative advantages were traded against one another by influential supporters of each colony. Although temporary market differentials had some effect on rise and fall, appropriations for internal improvements were probably more or less equal in the long run. Another factor which tended to mediate the rivalry between the colonies was the presence of hostile French and their Indian allies on the west. The constant conflict with the French and Indians forced upon the several colonies some measure of cooperation. By 1790, the situation had changed entirely. The French had retreated to the Mississippi leaving the Indians without supplies and more amenable to negotiations. Britain went from being a positive contributor to westward expansion to being a negative one. The threat she posed to American independence was a stimulus to growth. The result was that the restraints were removed from the rivalry of the colonial period and some real incentives were added. From 1880 to 1850, competition between Boston, New York, Philadelphia, Baltimore, Richmond, and Charleston for economic supremacy of the new nation led to support of a large number of internal improvement projects, the majority of which were transportation-related.

The history of the Staunton-Parkersburg turnpike indicates that the impetus for its construction was mainly on the state and not the local level. Many of the original settlers in the trans-Allegheny regions did not consider the connection to seaboard markets as particularly desirable or beneficial. They had come to

to recognize the role played by railroads, steamships and airplanes in the industrial development of western civilization. Few are aware that it was the turnpike that established the pattern which has been repeated so often during the last two hundred years.

The history of the Barrackville Bridge is bound up in the transformation of this geographical area from a frontier society, basically isolated, self-sufficient and familial, to a region more intimately connected to the eastern seaboard. The construction of turnpikes facilitated this transition and this bridge was part of one of them. Its structure shows that the turnpikes brought not only goods and immigrants to the west, but also information and technology. They were essentially routes of cultural transmission and their major institutions were the hotels, inns, and way-stations where such information was exchanged. As examples of the latest in eastern technology, covered bridges served a similar, if highly-specialized, function in such transmission. The Burr truss, the major element of the Barrackville Bridge, did not develop as part of frontier society but was brought from the East over the same turnpike of which it was a part.

the area to escape the social, religious and economic control of the dominant tidewater groups. This was particularly true of the Scotch-Irish Presbyterians, German Lutherans and German Reformed who had emigrated from Pennsylvania and New Jersey to set up their own cultural enclaves in western Pennsylvania, Maryland and Virginia. The process whereby they traded this autonomy for the commercial and material benefits of improved transportation was slow at best. Although it is doubtful that many people in rural areas saw the threat to cultural isolation in such overt terms the continued inability of local governments to raise funds to support such projects indicates a covert resistance to such change.

In 1823, the Virginia legislature authorized the construction of the turnpike from Staunton to Parkersburg on the Ohio River. (See Photocopy of map. HAER-WV-8-6.) It directed the State Board of Public Works to have a route surveyed and later appropriated funds for construction. Money was set aside for the revenues of Pendleton, Pocahontas, Randolph, Lewis, and Wood counties to be returned to them on the condition that each county provide an equal amount for the road. Construction sputtered through the 1820s because the counties would not come up with their matching funds. Exasperated, in 1830 the legislature authorized the Board of Public Works to raise $50,000 by means of a lottery. In 1832, additional funds were appropriated but, once again, the counties failed to match them. Finally, in 1838, the Board of Public Works was authorized to borrow $150,000 to build the road between Staunton and Dry Branch Gap. Farther west, the eventual route reflected the difficult time the Board had in gathering support for the enterprise. No less than five routes were considered. Wood County declined to support the route which did not follow the Little Kanawha, and the shorter and better route through Randolph County was changed in 1842 to make Beverly a point on the

road. In return, the citizens of Randolph agreed to pay $4,200 toward construction, and landowners agreed to relinquish all claims for damages. Subsequent improvements were paid for mainly by the state: $30,000 in 1845 for the section between Weston and Beverly, $5,000 in 1846 for the Beverly Bridge, and $25,000 in 1847-48 for other bridges. Between 1849 and 1853, more than $160,000 was appropriated to macadamize and maintain the road.[2]

While local farmers were not anxious to have the benefits of a new road to the east, merchants who controlled the state government had much to gain from improved transportation. It was patently obvious that the change of agriculture in the west from a subsistence to commercial basis would increase the wealth of seaboard cities and that coastal merchants and industries would be its principal beneficiaries. Increased grain shipments from the west, for example, helped to make Richmond a large flour-milling center prior to the Civil War and filled the holds of the shipping industry with export profits. Of lesser scope, but no less significant, were the benefits to merchants and businessmen along the proposed route. What little support there was at the local level seems to have come from those in newly-established towns. Towns like Beverly, Weston, and Parkersburg stood to gain considerably from an improved connection with the east. In the same manner that towns would later contribute to the new railroads, these communities took up collections to insure being made stops on the road. New roads meant new opportunities for local merchants and tradesmen. Hotels and liveries were needed. Cattle pens, corrals, and blacksmith shops met the needs of traders and teamsters. Retail stores sprung up to market incoming goods, and local authorities expanded to control and regulate these activities. (See HAER Report on Wheeling Centre Market.)

The difference in the level of support between the farm population and the town dwellers is an important distinction because it helps to clarify a common misconception concerning turnpikes and covered bridges. In fact, neither turnpikes nor their bridges were conceived, supported or built as a result of the felt need of the frontier farmer to get his goods to market. Except among historians of bridge engineering, the covered bridge is generally considered to be a product of folk culture, that is, of oral tradition. In fact, most covered bridges were not products of an oral tradition nor were they derived from traditional forms by rustic, native geniuses. Rather, they were well-articulated structures developed for profit and publicized in the popular press. The construction of turnpikes and the bridges associated with them was supported by the groups tied to the dominant culture of the towns not that of traditional, subsistence farming.

In 1848, construction began on the Fairmont-Wheeling Turnpike, a northwesterly branch of the Staunton-Parkersburg route. (See Photocopy of map, WV-8-7.) Originally conceived to develop on a commercial basis, the newly settled area north of the Staunton-Parkersburg road and south of the Northwestern Turnpike, this road was extended to Wheeling when that city took on new importance in the 1840s. At least part of the intention of the promoters of the project was to provide a route in competition with the Northwestern Turnpike (Winchester to Parkersburg) the National Road from Cumberland to Wheeling, and the newly opened B&O Railroad, all of which served to connect Wheeling to Baltimore and Philadelphia at the expense of Richmond.[3] Like the Staunton-Parkersburg Pike, the new road was financed almost completely by the State of Virginia - an indication of Richmond's feeling that it was losing touch with the northwestern part of the

state. By this time, the legislature had virtually given up trying to finance construction with local funds. No contributions were required from the counties except for rights of way.[4] The act of the Assembly, January, 1848, authorized the Board of Public Works to borrow $24,000 and to hire an engineer to begin work immediately.[5] By 1852, construction of the Fairmont-Wheeling extension had proceeded to the point where contracts could be let for the the bridges on the route.

The contract for the Barrackville Bridge was granted in April, 1853 to Lemuel and Eli Chenoweth, residents of the town of Beverly.[6] At that time, they had built or were completing at least five other bridges on the older Staunton-Parkersburg road.[7] The contract, signed by Superintendent Austin Merrill, was approved in Richmond on July 6, and called for completion of the bridge by December 1 on the condition that the masonry be ready by the 15th of September. The Chenoweths were to receive twelve dollars and fifty cents per lineal foot for the finished work - a total of $1,650 for the 132 foot span.[8]

Like many of the contractors who worked on the road, the Chenoweths were participants in the town culture which developed on the frontier.[9] In contrast to the simple agricultural existence which characterized the life of most settlers, they combined farming with business and civic affairs. Descended from a family of blacksmiths who settled near Baltimore in 1715, the Chenoweths were carpenters and cabinet makers in Beverly. Their grandfather, John Chenoweth, first settled in Beverly in 1800 and served four terms as county sheriff. Lemuel himself was a county commissioner in 1841, county coroner in 1855 and later a member of the state legislature.[10] When, in 1842, the citizens of Beverly took up a collection in support of the Staunton-Parkersburg Turnpike, Lemuel Chenoweth contributed

$100. In addition to their political and civic activities, the Chenoweths were carpenters and builders of considerable local reputation. The local housing boom which accompanied the formation of towns in this area gave them ample opportunity to exercise their trade. As agriculture flourished, they also benefited from the new demand for carriages and wagons. Their products became widely known for quality and durability. The Chenoweths were many-faceted individuals whose activities spanned the spectrum of town life on the developing frontier. The advent of the new highways provided them with another opportunity to illustrate the degree to which these elements were integrated in that culture.

Lemuel and Eli Chenoweth began their careers as bridge builders in the 1840s on the Staunton-Parkersburg Turnpike. They were granted contracts to build five bridges on that road, and their performance resulted in subsequent contracts for the major bridges on the Beverly-Fairmont-Wheeling Branch. In retrospect, it is obvious that the criteria for letting such contracts was not innovative design but rather quality of construction, proven administrative ability, and low cost.

The Chenoweths chose a Burr arch-truss as the principal structural form of the Barrackville Bridge. (See HAER drawing of transverse section. Sheet 2 of 3.) It was a design they had used before in their bridge at Philippi (1851-53) and one which had become popular throughout the east for spans over one hundred feet. The Burr arch-truss was composed of a multiple king-post truss superimposed on an arch. The two principles, truss and arch, acted as one system even though the arch was the primary bearing element. The truss portion performed the same function as the stiffening truss of a suspension bridge. It prevented distortion of the arch by static loads and resisted the longitudinal rotation of the arch

caused by moving loads. The truss element was the most variable aspect of Burr's design. In some earlier examples, the truss was much smaller in proportion to the whole and not all were of the multiple kingpost variety.[11] The Burr patent of 1817 used double diagonals in each panel but a single member per panel was commonly used later. By 1840, most contained a single diagonal sloping toward midspan at the top chord level. There was a practical reason for this arrangement: it was difficult to devise a joint that would develop the full strength of timber members in tension. Use of the diagonals in compression eliminated the need for a mechanical connection, allowing them to simply butt against an inclined seat or notch on the vertical. (See HAER drawing of typical panel. Sheet 3 of 3.) The vertical posts served as hangars for the deck joists and (above the arch) as supports for the roof joists. At Barrackville, the verticals were notches between the arch ribs and bolted through. Whether the bolts are original is not clear; they could have been added later as live loads increased. The iron rods from the arch to the bottom chord provide additional reinforcement between the main transverse joists and were added in 1934.[12] Considering the fact that the mortice-and-tenon joints for the horizontal bracing at the top chord are secured with wooden pegs ("trunnels"), there is a good chance that the structure was originally devoid of iron with the exception of the nails in the roof materials. As built, the Barrackville Bridge had neither siding nor sidewalk. The horizontal shiplap sheathing was added twenty years later and the "wart" with the sidewalk dates only to 1934.[13] (WV-8-3) It was not at all uncommon for such bridges to be left unsided and walkways for pedestrians were unnecessary while vehicles moved at the same pace as a man on foot. When the bridge was completed in 1853, it was a typical example of the Burr design.

The Burr truss was essentially a cabinetmaker's form, one which called for the ability to make the type of elaborate but tight-fitting joints found in a piece of furniture (See isometric of bridge panel. HAER. Sheet 3 of 3). To a large extent, its popularity was due to the abundance of timber and the widespread dispersal of such wood-working techniques. Their timberconstruction has often tended to obscure the fact that covered bridges developed in the mainstream of early 19th century engineering practices. Yet, even the earliest truss designers, such as Timothy Palmer, were relatively sophisticated as builders. Palmer's Essex-Merrimac Bridge in Newburyport, Massachusetts, used two arched trusses that were based on a design of the Renaissance architect, Palladio. Palladio's work, widely publicized in England during the 18th century, was the most sophisticated body of civil engineering and architectural technology available to American builders.[14] Palmer and Burr, along with others like Town, Howe and Wernwag, were connected by a common concern for the theoretical basis of truss construction (that is not to say, however, that they had mastered it). In 1811, Thomas Pope published an epigraph in his Treatise on Bridge Architecture which aptly characterizes the cultural position of these early bridge pioneers:

> Exulting science now disdains
> The ties of custom's proud control
> And breaks the rude and barbarous chains
> That fettered down the free-born soul.[15]

The mathematical regularity of this heroic-couplet form symbolizes the spirit of the age in which the truss bridge was conceived and propagated. Far from being a product of folk culture, its creation was a concrete realization of the revolutionary aspects of the new scientific knowledge of the Enlightenment.

The Chenoweth Legend

The legend which has grown up around the Barrackville Bridge, the Philippi Bridge and the Chenoweths flies in the face of what we know about the evolution of truss bridge engineering. The following is a representative version of the story which is usually accepted in the area.

> When the State of Virginia, more than a century ago, advertised for bidders to construct bridges west of the Alleghenies, Lemuel Chenoweth whittled and cut, with the skill of a college-trained architect, a miniature form of his idea of a modern wood bridge. He placed his miniature bridge complete in every detail, in his saddlebags and proceeded on his journey to Richmond on horseback. Upon his arrival there, he was obliged to wait patiently while the other bidders, who were considered to be the construction experts of their day, explained and outlined their plans. Being the last bidder to be called upon, he was asked if he wished to submit his plans, whereupon he arose and began to take the parts of his bridge from his saddlebags and assemble them upon a table. He then placed the bridge when assembled, upon two chairs which served as abutments. Then, placing his bridge upon these chairs, he deliberately stood and walked on the bridge. As he stepped down from the bridge, he said, "Gentlemen, this is all I have to say."[16]

This attempt to portray Lemuel as a country bumpkin whose native genius for design enabled him to outdo the "construction experts" in Richmond is one of the most interesting aspects of the bridge's history. While it does not teel us much about the bridge, it suggests a good deal about the more recent history of the area. It obscures the fact that the Chenoweths were connected by heritage and occupation to the dominant commercial class of western towns. They were aware of the economic consequences of the new turnpikes and supported them. They knew enough to participate in the competitive bidding practices and to base their design on a popular, well-tested model. The structure and the history of the Barrackville Bridge only serves to emphasize their connection to relatively

sophisticated engineering developments. The legend, on the other hand, is typical of much folklore in that it attempts to elevate the Chenoweths to heroic status. Later generations often use the apocalyptic tale in a hortatory manner, both to find solace in past achievements and as precedents for future action. The covered bridge and its builder have often been used as symbols for pioneer resourcefulness in the conquest of the wilderness. In most cases, such achievements were the result of the cooperative activity of a progressive segment of the society rather than of individual effort. This was certainly true at Barrackville. While the continued survival of their bridge attests to the Chenoweths' skill as craftmen, the historical records shows that they did not act alone. The absence of such bridges in present-day New York, Philadelphia, and Boston, taken with their continued survival in rural West Virginia, has led many people to falsely conclude that they were part of the folklore tradition. The structure of the Chenoweth's Burr truss proves that it was not.

Footnotes

1. James M. Callahan, History of West Virginia, Old and New (Chicago, 1923), pp. 49-65.

2. Ibid., pp. 182-183.

3. Festus P. Summers, The Baltimore and Ohio in the Civil War (New York, 1939), ch. 1.

4. Margaret E. Carnes, ed., Centennial History of the Philippi Covered Bridge, 1852-1952 (Charleston, W. Va., 1952), p. 52.

5. Acts of the Virginia Assembly, ch. 134 (1848).

6. Virginia Board of Public Works, Manuscripts 70-2512 (April 25, 1853). Hereafter cited as Contract.

7. Virginia Y. Downey, "Lemuel Chenoweth - Bridge Builder," in Carnes (ed.), Centennial History of the Philippi Covered Bridge, 1852-1952 (Charleston, W. Va., 1952), p. 37.

8. Contract.

9. Flora H. Findley, "Col. Luther Haymond - Engineer," in Carnes (ed.), Centennial History of the Philippi Covered Bridge, 1852-1952 (Charleston, W. Va., 1952), pp. 72-73.

10. Downey, pp. 39-40.

11. Henry G. Tyrrell, History of Bridge Engineering (Chicago, 1911), pp. 129-133.

12. It was common practice in the 20th century to reinforce older Burr trusses in this fashion. See Irving A. Jelly, "Anatomy of an Old Covered Bridge," Civil Engineering, Vol. II, No. 1 (January 1941), p. 13.

13. Richard A. Smith, "The Barrackville Bridge: A History and Description," unpublished manuscript, West Virginia University, Department of Civil Engineering, 1969, p. 21.

14. Carl Condit, American Building Art: 19th Century (New York, 1960), pp. 78-82.

15. Quoted in Condit, p. 86.

16. Downey, pp. 36-37.

ADDENDUM TO:
BARRACKVILLE COVERED BRIDGE
Spanning Buffalo Creek on Pike Street
Barrackville
Marion County
West Virginia

HAER WV-8
WVA,25-BARAC,1-

PHOTOGRAPHS

PAPER COPIES OF COLOR TRANSPARENCIES

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

BARRACKVILLE COVERED BRIDGE

This report is an addendum to a 15 page report previously transmitted to the Library of Congress in the 1970s.

LOCATION:	Spanning Buffalo Creek, Barrackville, Marion County, West Virginia UTM: 17.571520.4373040, Grant Town, WV Quadrangle
STRUCTURAL TYPE:	Wood covered bridge, modified Burr arch-truss
DATE OF CONSTRUCTION:	1853, rehabilitated 1999
DESIGNER/ BUILDER:	Lemuel and Eli Chenowith, Beverly, WV
PRESENT OWNER:	West Virginia Department of Highways
PREVIOUS USE:	Vehicular and pedestrian bridge
PRESENT USE:	Pedestrian bridge, bypassed in 1987
SIGNIFICANCE:	The Barrackville Covered Bridge was built in 1853 as part of the Fairmont & Wheeling Turnpike. It is architecturally significant as an outstanding example of a Burr arch-truss, a system patented by Theodore Burr in 1817. It is one of three surviving examples of the work of Lemuel Chenowith, a prolific West Virginia bridge builder.
HISTORIAN:	Lola Bennett, August 2002
PROJECT INFORMATION:	The National Covered Bridges Recording Project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by the Historic American Buildings Survey/Historic American Engineering Record, a division of the National Park Service, U.S. Department of the Interior. The Federal Highway Administration funded the project.

Chronology

1816—Virginia Board of Public Works established.

1823—Staunton & Parkersburg Turnpike chartered.

1850—Fairmont & Wheeling Turnpike chartered.

1853—Barrackville Covered Bridge completed.

1863—Barrackville Covered Bridge spared during Jones's Raid, April 29, 1863.

1872—Siding added (R.L. Cunningham, contractor).

1888—Barrackville Covered Bridge survives a great flood.

1934—Sidewalk added on east side; approaches improved; bridge truss reinforced with steel rod hangers; exterior painted (C.A. Short, Shinnston, WV, contractor).

1951—Supports added to stringers.

1973—Barrackville Covered Bridge listed on the National Register of Historic Places

1975—Floor system repaired and deck replaced; re-sided and re-roofed.

1987—Bypassed with a temporary bridge

1991—Permanent highway bridge (No. 3522) built adjacent.

1999—Major rehabilitation completed--sidewalk removed; windows removed; posts and beams reinforced; steel roof added (Orders Construction and Allegheny Restoration Workers, in consultation with the Institute for the History of Technology, West Virginia University)

Description

The Barrackville Covered Bridge is a single-span modified Burr arch truss wooden covered bridge on drylaid sandstone abutments. The total length of the truss is 146'-3", with a clear span length of 131'-8". The truss is 11'-8" high center-to-center of the chords and 17'-11" wide center-to-center of the trusses, with a roadway width of 15'-6". Clapboard siding covers the exterior, and standing-seam metal roofing covers the gable roof.

The bridge is poplar and oak framed in the manner patented by Theodore Burr in 1817. The principal structural components are a pair of hewn timber segmented arches framed into and around a pair of multiple kingpost trusses to create an indeterminate composite timber structure. The arches spring from stone skewbacks on the facewall of the abutments, span 131'-8" and rise 13'-8" to the crown. Each arch is composed of 6x14" paired timbers that are notched around and bolted through the posts of the trusses. Upper and lower chords connected by vertical posts and diagonal braces make up the multiple kingpost truss. Each truss has thirteen panels, spaced 10'-2" center-to-center of posts, plus two 6'-7" end panels. The upper chord is paired butt-jointed 7x9" beams. The lower chord is paired, offset butt-jointed 6x12" beams. Vertical posts with notched and belted connections join the chords. The posts are 8x10" wooden timbers framed through arch and lower chord. The diagonals are 7x8" timbers, which are notched into the posts and pinned with treenails. In this particular example, the builders used a variation of the Burr truss design by putting cross bracing in the center and end panels.

Transverse wooden floor beams notched into the top of the lower chord at each panel point make up the floor system. Threaded adjustable tension rods have been added under each floor beam. There are 3x12" plank stringers laid diagonally on top of the floor beams, and 2x4" plank flooring is laid transversely on the stringers. A secondary roadway deck of stringers and floorboards sits on top of the primary deck.

Dimensioned lumber frames the upper lateral system. Tie beams are fastened to the tops of extensions on each post and frame into the rafters. There are sway braces between the posts and tie beams, and diagonal cross bracing (4x7" timbers) between the tie beams. The rafters frame from the ends of the tie beams. Standing-seam metal roofing fastened to wood purlins on top of the rafters covers the gable roof.

Wood clapboards cover the exterior of the bridge to about 2' below the eaves. The outer faces of the arches extend just beyond the face of the sheathing. The portals have projecting pediments with arched openings and pilaster moldings on the outer faces of the endposts.

The abutments are drylaid, cut ashlar sandstone. The lower chords of the bridge rest on bedding timbers on top of the facewall. The backwall above the abutment and behind the

bedding timbers serves as a retainer for the roadbed. Stone wingwalls extend from the backwall along the roadway at both ends of the bridge.

West Virginia Covered Bridges

Although many covered bridges were built in West Virginia in the mid nineteenth century, most of them (with the exception of the Barrackville and Philippi bridges) did not survive the Civil War. According to the World Guide to Covered Bridges, West Virginia presently has seventeen surviving covered bridges, with construction dates ranging from 1853 to 1911, the majority (58 percent) being built between 1881 and 1899. The Barrackville Covered Bridge is one of three Burr arch-trusses in West Virginia, and one of three surviving examples of the work of Lemuel Chenoweth, a prolific West Virginia bridge builder.[1]

Barrackville

Located in Marion County, West Virginia (originally part of Augusta County, Virginia; later Monongalia County, Virginia) the hamlet of Barrackville was named for Henry Barrick, who established a blacksmith shop near this site in 1810.[2] Henry and his son John operated the shop together until Henry's death in 1866, and then John continued the business alone until 1886. The Barricks reportedly made the bolts used in the Barrackville Covered Bridge in 1853. In 1832, another early settler, Adam Ice along with his son, William Bayles Ice, built a gristmill just below the bridge site on the south side of Buffalo Creek.[3] In 1852, the B&O Railroad was built through Barrackville, just north of this site.

Fairmont & Wheeling Turnpike

The Barrackville Covered Bridge across Buffalo Creek was built in 1853 as part of the Fairmont-Wheeling Turnpike, a branch of the Staunton-Parkersburg Turnpike authorized in 1823 by the Virginia Legislature and Board of Public Works.[4] The route surveyed for the turnpike extended from Staunton to the mouth of the Little Kanawha River. The legislature hoped the access provided by such a road would encourage the commercial development of the already settled farming areas between the James River & Kanawha Turnpike in the south and the Northwestern Turnpike in the north. In 1848, the

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[1] National Society for the Preservation of Covered Bridges, World Guide to Covered Bridges, database printout, April 2002.
[2] Marion County was formed from part of Monongalia and Harrison Counties in 1842. The name "Barrackville" was originally used for the section of town north of Buffalo Creek while the main part of town was called Blairsburg. Sometime after the Civil War, the name Barrackville was applied to the entire town.
[3] Said to be the first white child born west of the Allegheny Mountains.
[4] West Virginia attained statehood in 1863.

legislature authorized the construction of the Beverly-Fairmont Road, and in 1850, a northward extension from Fairmont to Wheeling. Under the direction of Col. Austin Merrill, this 71½-mile turnpike was constructed between 1852 and 1854.

Construction of Barrackville Covered Bridge

Engineer Luther Haymond undertook surveys of the proposed Fairmont & Wheeling Turnpike in 1850. Haymond's surveyor's field book, "Notes of the location for the Fairmont & Wheeling Turnpike Road, June 11, 1850," shows a sketch of the Burr arch truss covered bridge to be built at Buffalo Creek. The notation says 122' span, but Supt. Austin Merrill later increased this to 130'. Several secondary sources indicate that the bridge was not sided until 1872, nearly twenty years after its construction.[5]

Construction of the road began at Fairmont in 1852. Contracts were let for individual sections and for bridges. The Barrackville Covered Bridge was let under two separate contracts in 1852, one for the superstructure and one for the abutments. The Board of Public Works received proposals from many local builders and farmers, including one from Lemuel and Eli Chenoweth of Beverly, Randolph County, West Virginia.

Fairmont July 12, 1852

> We the undersigned propose to build the superstructure of a Bridge across Buffalo Creek in Marion County upon the plan adopted by the superintendent of said work for the sum of twelve dollars and fifty cents per foot lineal measure. And to have the same ready for the travel to pass over on the fifteenth day of November 1853 provided we can have the masonry to raise the superstructure on by the fifteenth of September 1853.
>
> E. & L. Chenoweth

The contract for the superstructure was let to Lemuel and Eli Chenoweth, and the contract for the masonry was let to John and Robert McConnell. A few days later, on July 19, 1852 Supt. Austin Merrill wrote to the Board of Public Works:

> The Buffalo Bridge on the lowest bids supposing there will be 500 perches of masonary [sic] will cost about $3626.00. Supposing the superstructure or wood work to be 142 feet. I have increased the span of the bridge 8 feet above that given by the engineer as it must necessarily be built lower than is desired to conform with the railroad. Therefore I thought it best to give ample space for the water as it is a rapid stream, and as it will also afford some advantages in the excavations for the Butments [sic]. …As it will

[5] Myrtle Auvil, Covered Bridges of West Virginia past and Present (McClain Printing Co., Parson, WV, first ed. 1972; revised ed., 1973) p.77; Brenda Krekeler, Covered Bridges Today (Canton, OH: Daring Books, 1989), p.351.

> require a considerable expenditure to construct this bridge, it is very important that we should have an experienced mechanic or bridge builder.

The Barrackville Covered Bridge was constructed during the summer and fall of 1853. The October 15 Annual Report of the Virginia Board of Public Works stated:

> The Buffalo creek bridge is now raised, and will be completed about the middle of November. The masonry work of this bridge was done by the Messrs. John and Robert McConnell, and the superstructure by Messrs. Eli and Lemuel Chinowith [sic]. The material used in the construction of this work is of the very best quality, and the work has been done in a manner highly creditable to the contractors, of both wood and stone. And I think I hazard but little in saying this bridge, when completed, will have but few equals, and perhaps not a superior in the Commonwealth of Virginia of its kind.

Lemuel Chenoweth (1811-1887)

In 1715, John I. Chenoweth, a blacksmith from South Wales came to America and settled in Baltimore County, Maryland. His great grandson John purchased land in Randolph County, Virginia, in the late eighteenth century, established a farm and raised a family. His son, John, was the father of Lemuel Chenoweth.

Lemuel Chenoweth was born to John I. and Mary Skidmore Chenoweth near Beverly, Virginia (now West Virginia) in 1811. He was one of eight children. He was schooled in country schools and learned carpentry and cabinetmaking as a young man. He was in business with his brother Archibald, a wagon-maker, for a short time, and later with another man, James A. Vaughan, with whom he also collaborated in building wagons. In 1836 he married Nancy Ann Hart and together they raised thirteen children. According to Donald Rice's 1987 Bicentennial History of Randolph County, West Virginia, Chenoweth was a craftsman, architect, builder and inventor. He designed and built tools, furniture, wagons, houses, the Presbyterian Church at Huttonsville, West Virginia, invented a reverse-action saw ("the forerunner of the modern double band sawmill"), and in 1859 attempted an invention of machinery for laying the Atlantic Cable.[6]

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[6] Creek, Lewis County; Buchannon, Upshur County; and the Greenbriar bridge at Marlington, Pocahontas County. …There is reason to believe that he also built three other bridges in Lewis County"; however, the Virginia Board of Public Works Annual Reports state that the bridge at Weston was built by another contractor, John---, so the accuracy of this statement is questionable.
Little information has been found about Lemuel's younger brother, Eli, but he is listed in the 1850 Randolph County census as a 25-year old bridge builder. His name does not appear in the 1860 or 1870 census.
[6] National Register of Historic Places Inventory-Nomination Form, Covered Bridges of West Virginia, 1980.
[6] This story is found in histories of other covered bridges as well, a fact that is documented in Duane Ellifritt's article, "Early Engineering in the Hills," The West Virginia Hillbilly, February 11, 1978. The existing documentation for Barrackville bridge shows that turnpike engineer Luther Haymond planned a Burr arch truss for this site as early as

It is unclear when Lemuel Chenoweth began building bridges, but the (reportedly fourteen) bridges attributed to him were built between 1847 and 1873, and he is listed in the 1850 and 1860 Randolph County, West Virginia census as a "bridge builder."[7] In the 1870 census he is listed as a wheelwright. The Barrackville Covered Bridge is one of three surviving covered bridges attributed to Chenoweth, the others being the Philippi Bridge (1852, a double-barrel, two-span Burr arch truss), and the Carrollton Bridge (1855, a single span Burr arch), both in Barbour County, West Virginia.[8] Lemuel Chenoweth has achieved almost mythical status in West Virginia because of his bridge building skills and the number of bridges attributed to him. According to one local legend regarding the Barrackville Covered Bridge,

> [Lemuel Chenoweth] arrived in Richmond in 1850 with a model of his bridge packed in his saddle bags. Before the Board of Public Works which was then considering bids for the construction of bridges, Chenoweth assembled his model "made of poplar and nary a nail in 'er," suspended the frail looking toy between two chairs, stood upon it, and challenged his competitors to put their models to the same test.[9]

Subsequent History of the Barrackville Covered Bridge

The Barrackville Covered Bridge was an important link in the overland route from Fairmont to the Ohio River at Wheeling and is one of only a few wooden covered bridges in Virginia and West Virginia to have survived the Civil War. Railroads and highways were so vital to the strategic movement of troops and supplies that both Union and Confederate armies attempted to disrupt transportation along the railroads and turnpikes

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June 11, 1850, and Lemuel and Eli Chenoweth did not bid for the contract until July 14, 1852; this suggests that the story is probably just another folktale, although it is found in nearly every history of the Barrackville Covered Bridge.

[6] National Register of Historic Places, Covered Bridges of West Virginia. Virginia Downey (Chenoweth's great granddaughter), 1952 article, revised for publication in Donald L. Rice, Randolph 200: Bicentennial History of Randolph County, West Virginia, Randolph County Historical Society, 1987.

[7] Various sources attribute different numbers of bridges to Chenoweth. It appears that he built at least five bridges on the Staunton and Parkersburg Turnpike; Calvin Conaway, in his 1947 book Covered Bridges of West Virginia states "There is definite information from good sources that [Chenoweth] built the following bridges: Philippi and Middle Fork, Barbour County; Barrackville, Marion County; Beverly, Randolph County; Weston, Stone Coal Creek, and Polk Creek, Lewis County; Buchannon, Upshur County; and the Greenbriar bridge at Marlington, Pocahontas County. …There is reason to believe that he also built three other bridges in Lewis County"; however, the Virginia Board of Public Works Annual Reports state that the bridge at Weston was built by another contractor, John---, so the accuracy of this statement is questionable.

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[9] This story is found in histories of other covered bridges as well, a fact that is documented in Duane Ellifritt's article, "Early Engineering in the Hills," The West Virginia Hillbilly, February 11, 1978. The existing documentation for Barrackville bridge shows that turnpike engineer Luther Haymond planned a Burr arch truss for this site as early as June 11, 1850, and Lemuel and Eli Chenoweth did not bid for the contract until July 14, 1852; this suggests that the story is probably just another folktale, although it is found in nearly every history of the Barrackville Covered Bridge.

by destroying each other's bridges.[10] According to bridge historian Richard Sanders Allen, many Civil War battles were fought at, or near, the covered bridges along those established corridors:

> Military actions which involved covered bridges were commonplace during the Civil War. Once-friendly spans, their cool shadows turned sinister, were fought over, destroyed and rebuilt by both great armies during the four years of the world's first modern war. All over the South they carried main highways, particularly along the invasion routes through Virginia. …In the western counties they led turnpikes over the West Fork, the Gauley, the Shenandoah and the Cheat.[11]

According to local legend, William Bayles Ice (owner of the grist mill adjacent to the Barrackville Covered Bridge) and his wife Dolly are credited with saving the bridge during the Civil War, when Confederate Gen. William E. Jones arrived with his troops in Barrackville on April 29, 1863:

> He came this way, destroying railroad bridges to stop the Union's supply lines and had also intended to burn the Covered Bridge. Bayles Ice was a Southern sympathizer and had a son and son-in-law serving in the Confederate Army. He prevailed on General Jones to spare the bridge as it meant a great deal to him and his family's welfare and was of no particular strategic military significance. After that, the Union Army stationed about 100 men in Barrackville to guard the bridge and railroad.[12]

The Barrackville Covered Bridge carried traffic until 1983, when a temporary bridge was installed alongside it. The bridge underwent a major rehabilitation in 1998-99, at which time an Acrow panel bridge was installed inside it so rotting beams and posts could be removed, repaired with epoxy, and reinforced with fiberglass. The floor system was replaced and most non-original material, including the 1930s sidewalk, was removed to decrease the dead load on the bridge. The bridge was reassembled and covered with new clapboard siding (painted white), and re-roofed with a corrugated metal roof.[13]

Burr Arch Truss

Theodore Burr was born in Torringford, Connecticut in 1771 and died at Middletown, Pennsylvania in 1822, but spent most of his life in Harrisburg, Pennsylvania. His father

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[10] National Register of Historic Places, Covered Bridges of West Virginia.
[11] Richard Sanders Allen, Covered Bridges of the Middle Atlantic States (Brattleboro: Stephen Greene Press, 1957), p.29.
[12] Marion County Historical Society, A History of Marion County, West Virginia (Fairmont, WV, 1985), p.40.
[13] The stabilization and rehabilitation project is described at length in the following document: Institute for the History of Technology and Industrial Archaeology, "Barrackville Covered Bridge Restoration Project," (Morgantown: West Virginia University, 1999).

was a millwright, so Theodore learned construction at an early age. As a young man, Burr moved to Chenango County, New York, established a saw and grist mill, and shortly thereafter built his first bridge, a timber stringer span, in Oxford, New York in 1800. Within a short time, he began getting requests to build bridges throughout the northeast. Among the early spans he erected were a 440' drawbridge at Catskill in 1802, a 330' arch bridge across the Mohawk at Canajoharie in 1803, and a five-span bridge over the Delaware River at Trenton, New Jersey in 1806.[14]

Until the mid nineteenth century, mathematical engineering analysis was virtually unknown. Bridges were designed by empirical method, that is, by a combination of intuition, experimentation and practical experience. The combining of arches and trusses in bridge design is seen as early as the sixteenth century in the writings of Italian architect Andrea Palladio (1518-1580), who is reportedly the first to illustrate and build a truss bridge.[15] In 1764 a wooden bridge was built in Switzerland with "trusses consisting of rectangular frames supported by massive arched ribs."[16] America's pioneer bridge builders Timothy Palmer and Louis Wernwag, who preceded the work of Burr, built bridges that were highly indeterminate combinations of arches and trusses. Nevertheless, Theodore Burr is credited with being the first to separate the truss and arch to make a bridge with a level deck.

In 1806 and 1817 Burr took out patents for a multiple kingpost truss with arched reinforcing ribs.[17] Burr's predecessor, Timothy Palmer (1751-1821), who is believed to be the first American bridge builder to advocate weatherboarding and roofing bridges to protect them from exposure to the elements, also designed combination arch-truss bridges, but Burr took the concept further by carrying the below-deck arch ribs of Palmer's last bridges up into the truss, thereby leaving both the deck and truss horizontal.[18] By combining the arch and truss into a single structure, it appears that the strengths of each form are called into play, and the two structures work simultaneously as an integral system, each carrying part of the load, thereby increasing rigidity and reducing deflection under load.[19]

In an effort to reduce the need for complex joinery, Burr in his 1817 patent recommended eliminating mortise connections at the posts and diagonals, advocating instead, "merely butting suitably mitered ends to save much of the carpentry effort and expense."[20] Thus, ordinary carpenters were able to erect Burr arch-trusses, which only increased the popularity of the type.

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[14] Richard Sanders Allen, Covered Bridges of the Northeast (Brattleboro Vermont: Stephen Greene Press, 1957), p.14.
[15] Andrea Palladio, Four Books of Architecture, 1570.
[16] J.G. James, "The Evolution of Wooden Bridge Trusses in 1850," Journal of the Institute of Wood Science, June and December 1982, p.124.
[17] This patent was lost in the 1836 U.S. Patent Office fire.
[18] James, p.171.
[19] See Historic American Engineering Record, National Park Service, U.S. Department of the Interior, "Pine Grove Bridge," HAER No. PA-586.
[20] According to covered bridge historian Joseph Conwill, the 1817 patent calls for mitered joints, but in practice, Burr used shouldered posts like many later builders.

The Burr arch-truss was popular in the mid-nineteenth century for railroad bridges and highway spans of 100' or more. According to one source, thousands of such bridges were constructed, particularly for longer spans.[21] The longest single-span wooden covered bridge on record, the 360' McCall's Ferry Bridge in Pennsylvania, was a Burr arch-truss. Today, there are as many as 215 wooden covered bridges classified as Burr arch-trusses remaining in the United States.[22] The vast majority of these are located in Pennsylvania and Indiana.

[21] Brenda Kreckeler, Covered Bridges Today (Canton, Ohio: Daring Books, 1988), p.18.
[22] There are perhaps ten more classified as Burr variations. National Society for the Preservation of Covered Bridges, World Guide to Covered Bridges.

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